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The Air Line Pilot

September, 1956

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The F-1 Safari

Airport Safety: A Pilot's View

This May Not Seem A Glamorous Subject But It's Important To Pilots. Here The Author Discusses Ways To Improve It With Present Equipment, Facilities, Operating Practices

By Capt. E. A. Cutrell
AA

Airport Safety may not seem to be a glamorous subject, but it is an important one from the pilots' viewpoint. Many serious accidents have been on or near airports. Each of us is familiar with some of these accidents and can recall many other incidents that could have been serious—in landing, in taking off, in over-shooting, under-shooting, near misses, circling approaches or skidding on icy or wet runways. Within these realms we shall discuss here ways and means of improving airport safety with our present equipment, and our present facilities and our present operating practices. It is even more important that we explore some of the aspects of Airport Safety in relation to the coming turbo-jet airplanes.

Visual Aids

To begin this discussion, I would like to present some thoughts on facilities for transition from instrument to visual flight for landing in restricted visibility, since this is a realm where much can be done to improve airport safety. Serious consideration must be given to the early implementation of the best possible visual aids at all airports where turbo-jet airplanes are to be operated. Both radio and visual aids for opposite direction approaches will be extremely important for turbo-jet landing. The United States has been backward in installing dual direction landing aids at even our most congested terminals. We have struggled along with barnstorming techniques of circling approaches and tail wind landings up to this time with our single direction approach facilities. London Airport has radio and approach lights in four directions. In Canada, major airports like Montreal are provided with two ILS and approach light systems.

It has taken ten years since World War II to get a program initiated for the installation of a good approach light system. Many years of evaluation were wasted during this time in sorting out several unsatisfactory configurations until the center-line system of bars was adopted as a national standard known as configuration A. This center-line system with sequence flashed condenser discharge lights has been in service at Newark Airport for several years and placed in operation at Idlewild Airport in January. It will be progressively installed at major air line terminals as funds become available.

Single Standard Needed

It is hoped that the military will soon make an evaluation of this configuration both with condenser discharge lights in the outer 2000 feet of their configuration "B" and flush bars through the 1000 feet of over-run area in order that there can be one single standard of approach lighting at civil, joint-use and military airports. We, as air line pilots are particularly concerned with the joint-use airports, since there is a trend toward having a second standard of approach lights at these airports, by the installation of Configuration B, wherein the center line bars are dropped 1000 feet from the threshold. In addition to better approach guidance, the center-line lights through the 1000-foot over-run area down to the runway threshold will prevent undershoots. This statement is supported from an Air Force "Flying Safety Newsletter" sent out in December, 1955, by the Air Research and Development Command as follows:

"Short landings have become a major problem area in the safety program. Here are a few bits of info on which to base corrective action:

62% of all undershoot landings occur on runways of 7000 feet or longer.

72% of jet undershoot landings occur on runways of 7000 feet or longer.

During the first 8 months of 1955, 12 USAF Cargo planes were involved in undershoot landings.

Two solutions which have met with considerable success at individual bases are:

1. Erection of a frangible fence of light lumber with the tops sharpened to resemble a picket fence. The pickets are stuck into the over-run about twenty feet short of the runway and are inclined toward the runway. They are painted with luminous paint for night visibility. Aircraft striking these will merely push them over.

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2. Dwarf evergreen shrubs are planted in a semi-circle just short of the runway, making sure that no small mounds of earth are left to cause damage to landing gear.

The psychological effect of these harmless but visible barriers causes pilots to add those vital few feet to their glide path."

Preventing Undershooting

In conjunction with the evaluation of over-run flush lighting, service tests should be conducted on flush type threshold lights to provide a complete green threshold bar across the end of the runway. These also will alleviate undershooting.

With the advent of good approach lighting it has been possible to penetrate lower visibility weather only to become aware of the lack of visual guidance on the runway for flare and landing.

This problem was aptly described by the International Air Transport Association Technical Conference Report at the May, 1952, meeting in Copenhagen as follows:

"The meeting was reminded that the danger is now recognized of providing a good approach lighting system and neglecting the requirement for runway lighting and runway markings for use under marginal conditions; this has been described by pilots passing from the approach to the runway lighting pattern at night as 'flying into a dark hole'."

Jenks' Study

This problem has been more recently analyzed by Mr. Arthur F. Jenks of the CAA in a paper presented to the IATA Technical Conference at Amsterdam, November 14-22, 1955. In this paper, Mr. Jenks tells why our present runway lights, even the best high intensity types, are not satisfactory for flare and landing in the lower visibilities. Due to the wide-spread spacing between the rows of runway lights, particularly runways 200 feet in width, the near lights retreat outward from the pilot's foveal vision, at the flare stage of an approach.

Research on the subject of a pilot's direct vision in the flare and landing stage indicates that the normal focal point down the runway is some 800 to 1000 feet when visibility is not impaired. Also, a photographic study by the Sperry Corporation shows that during this part of an approach to land, the eyes are fixed rather than searching for guidance information. Furthermore, optical experts have concluded that the direct angular width of the foveal vision is possibly less than 5 degrees.

At 1000 feet ahead, the side runway lights form an angle from the pilot of 11.3 degrees on a 200 foot runway and 8.53 degrees on a 150 foot runway. Consequently, the point source runway lights at these wide angles do not furnish the necessary ground plane alignment guidance or the much needed indication for height judgment, since they retreat beyond the direct vision area. In the narrow angle of a pilot's foveal vision, it remains necessary to rely on runway markings, tire marks, or other runway texture to complete the approach down to the runway and to make the flare and landing, in the lower visibilities.

Side Lighting Ineffective

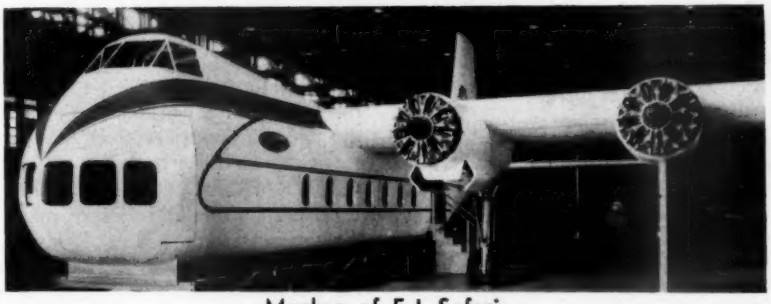
These studies appear to give an added realistic reason why runway side lighting is ineffective for flare and landing. The lights do not appear in the picture seen when reaching the so-called stare stage in flaring to land. It confirms our own experience of seeking runway texture forward of the airplane in landing at night even though the runway lights are normal in intensity.

We all realize the trouble that a pilot can get into trying to find the tire marks, runway markings or other texture in fog, precipitation or when the runway is wet or covered with ice or snow. At the Amsterdam IATA Technical Conference, a thorough study was made of those requirements for runway lighting that will give the desired guidance for the latter stages of approach and landing. The practical implementation to meet these requirements for operating in the extremely low visibility conditions is indeed a monumental undertaking, compared with other visual aids installations, particularly if no better solution is found than the construction of flush lights in a double row configuration on the first section of the runway.

To meet the requirement for ground plane indication and height sensitivity, it appears that each fixture in such an arrangement should give a bar effect, being composed of perhaps 3 lights at

(Continued on Page 15)

On The Cover



Mockup of F-1 Safari.

Recent orders have been announced by a number of smaller air carriers for the four-engined F-1 Safari, designed as a DC-3 replacement by the Frye Corporation. It seeks to meet the specialized requirements of short and medium-range operations, both passenger and cargo, with the ability to take off and land on short, unsurfaced airstrips.

According to Jack Frye, founder and president of the Fort Worth-based aircraft company, the prototype Safari is scheduled to make its first flight in February, 1957, with deliveries of production aircraft expected to begin in July of the same year.

Powered by four P&W Wasps, a Safari carrying a 14,292-pound useful load will need a takeoff distance of 2,300 feet to clear a 50-foot obstacle. Landing with the same load, the transport will let down over a 50-foot obstacle and stop in a distance of 1,700 feet. The F-1 will require an airport length at sea level under Civil Aeronautics Administration regulations of 2,800 feet.

The new airliner will have a cruising speed of 171 mph. at 8,000 feet and a landing speed of 62 mph., Frye announced. Its all-passenger version will carry 51 persons plus crew.

Frye listed these specifications for the F-1: gross weight, 37,000 pounds; empty weight (cargo), 22,646 pounds; center of gravity limits, .20 MAC forward and .36 MAC aft; wing span, 109 feet 6 inches; wing area, 1,500 square feet; overall fuselage length, 75 feet 10 inches; vertical tail height, 30 feet.

The TACAN Story

The Writer Relates The Background Of This Navigation System Which Has Become A Controversial Subject To Many In The Aviation Industry

By Col. J. F. Taylor, Jr.
Director, ANDB

I believe, with the ever increasing urgency for developing an adequate air navigation system to meet present and future needs, TACAN has taken on a new importance for all who use today's air space.

The system has not changed—it is still the same old TACAN—improved perhaps in some ways, but fundamentally it is the same 1,000 megacycle rho theta gear.

While many of its technical aspects are generally known, most are not familiar with the side lights in TACAN's history and how the navigation system argument developed to where it is today. I would like to tell you about this lesser known side of TACAN, and discuss its present status.

There is no doubt that the system is a controversial subject to many in the industry.

Traces Origin

During the immediate post-war years, a military requirement was approved for a carrier-based navigation system to replace the obsolete Y-G homing equipment of World War II years. A formal statement was adopted by the Navy in 1947 concerning the required military characteristics for this important navigation function which considered the need for single seater fighters and other carrier-based aircraft.

Also of importance were: small antenna size of the surface gear to allow installations on various classes of naval craft; accuracy in bearing and distance compatible with that of ship-based radar; and that the system be unaffected by inclement weather and by sea states associated with high ocean crests and troughs.

Although is was early in the jet era, it was recognized that having flush antennas on the airborne equipment was a necessity. The Navy contracted for this equipment, which was to furnish azimuth-only, in 1948. Distance was added in 1949. It was this latter equipment which became known as TACAN. The Air Force, working completely independently, developed similar requirements.

Shortly after the time of TACAN's inception, both Navy and Air Force participated in, agreed in principle, and backed the findings of the Radio Technical Commission for Aeronautics' Special Committee 31. This system, proposed by SC-31, which later became known as the "Common System," was at that time associated by the military with Federal airways. This attitude is supported by the first charter of the Air Navigation Development Board, which placed the responsibility on the Board for developing an air navigation and traffic control system which met the operational requirements for civil and non-tactical military aviation.

Two Systems

I want to emphasize the phrase "non-tactical." In my opinion this was a departure from the common system concept. Radio Technical Commission for Aeronautics' Special Committee 31 did not talk about "tactical" and "non-tactical" military aviation. I was a member of that special committee and I, at least, thought we were planning a system common to all aviation. "Tactical" military was definitely not an exception. Some agencies or individuals evidently honestly thought otherwise. At least somewhere between the forwarding of the common system plan to the Air Coordinating Committee and the time of approval of the charter of the ANDB, whose duty it was to research and develop hardware based on the common system plan, the words "non-tactical" were inserted. This immediately permitted two systems to exist: one, the common civil, non-tactical military; and the second, the tactical military system.

'Tactical System'

Thus the principle of a tactical plus a non-tactical system became approved United States policy, and published in ACC papers which established the Air Traffic Control and Navigation Panel of the Air Coordinating Committee and in the Air Navigation Development Board. These papers are dated 16 April 1948, and 10 June 1948, respectively.

I am emphasizing this because there has been discussion if the military was developing TACAN in competition to VOR/DME, and planned it for common system use from the beginning. There was no thought in the military, that I have been able to discover or that I was aware of at that time through my personal knowledge of Air Force plans, that TACAN was to be anything but a tactical system to be used in fleet operations and, in the case of the Air Force, in tactical situations which, in modern military history at least, had always occurred outside the United States. It was the system to be used for "tactical military," as distinguished from the non-tactical or common system. It was to be the second system which was permitted to exist by virtue of inserting "non-tactical" in the ANDB'S work statement.

Events which occurred in 1949, 1950, and 1951, including our involvement in the Korean conflict and the Russian achievement in exploding an atomic device, only intensified military requirements for a tactical navigation system. By this time it was fairly common knowledge that the Air Navigation Development Board's common system and TACAN were developing along technically incompatible lines and that attempts to solve the incompatibility were unsuccessful.

Post-Korean Thinking

The conclusion of the Korean conflict, plus the realization that the United States was in for a long pull, in which our home land could well be the battlefield of an air war, caused a change in concept by the military. It had now become apparent, and to me this is the most significant event in TACAN's history, that the tactical navigation requirement for the military no longer applied to overseas operations only, but involved the United States as well. Also, the realization was growing within the military services that security classification of equipment was not a good protective measure towards denying the enemy information regarding its use.

One of the results of these two changes in concept was that the Air Navigation Development Board was advised by the military that TACAN appeared to satisfy the requirement for a rho theta navigation system and suggested that it be put to this use. This offer was based on the military's realization that it could carry only one navigation system and that this system had to meet at least the minimum requirements of its most exacting users —which were the military. Perhaps a similar way of saying this, was: the military now offered TACAN on the basis that the common system no longer was confined to the requirements of the civil and non-tactical military, but rather had to satisfy the requirements of civil and tactical military users.

ANDB's 1954 Charter

When the new ANDB charter was developed in January 1954, the board recognized as its highest priority task the solution of the VOR/DME-TACAN dilemma. Although I have never heard it said in exactly this way, I am confident that the new Board realized that the former non-tactical, military requirements for a common system had now become fully tactical requirements. The Board also realized that it was trying to solve a situation where numerous previous attempts had been unsuccessful. It was fully aware of the emotions and other attachments that individuals and agencies felt for components they had sponsored, developed, and installed. The Board, nevertheless, took on the job because solution to the basic navigation aid problem was necessary. Whether or not the common system concept was to continue, the tactical and non-tactical systems had to be made compatible.

Most of you are aware of the Board's action early in 1955 when it acted to clear the way for the adoption of TACAN, providing certain unknowns were solved in TACAN's favor. In review, the unknowns were:

- The navigation requirements in terms of the number of channels needed for common system use in the Continental United States;
- The relationship between the common system short range navigation system and the electronic ground environment being developed for national defense;
- Any international implications attached to the TACAN standardization move.

My staff was assigned the task of determining the various facts involved in these unknowns. But before I report these I would like to comment on misunderstandings that apparently still exist.

Denies Secrecy

People often say to me that the development of TACAN was not made known to aviation agencies in the government outside of the military departments. This statement is not consistent with the action taken by the Bureau of the Budget in 1951. When reviewing military programs, the Bureau of the Budget, noting a duplication of navigation systems and the divergence of TACAN from the common system concept, asked the then Secretaries of Commerce and Defense for the implications of the duality of the programs. Both the Departments of Commerce and Defense began a study of the problem, which resulted in recommendations for separate systems; one system for civil and non-tactical military, the other for tactical military flying. The Secretary of Defense, after further studies and consideration, approved this report largely on the basis that tactical navigation requirements existed only outside the United States.

The point I am trying to make here is that the TACAN project was known to all appropriate government agencies, at least those that were represented on the Air Coordinating Committee, and was subjected to the governmental coordination that was proper at that time. Here again you will note the two system concept that I mentioned earlier —the concept that, I think, has now become untenable.

Quotes Damon Letter

Another example which indicates that TACAN was not "spawned in secrecy by the military in competition to the common VOR/DME" is Mr. Ralph Damon's letter dated November 20, 1951, to the Secretaries of Commerce and Defense. At that time Mr. Damon was Chairman of the Air Navigation Development Board. This letter states in part:

". . . in the past two years, the Department of the Navy has instituted a development program for a different type of omni-range and distance measuring facility . . . However, it appears that recently the Navy has suggested that its proposed system be adopted by the Air Force and Navy in place of the present common system to meet their joint needs . . . The technical characteristics of the Navy system will not be fully known until after an extensive period of testing and evaluation. If the Navy system then appears markedly superior, it should be adopted . . ."

The two examples that I have just related are only a small sample of correspondence and meetings, whose minutes are still on file, which took place in an attempt to solve the navigation dilemma. I am mentioning them not in defense of TACAN nor the military, nor as a criticism of any agencies involved. Recrimination now will certainly not contribute to an acceptable solution. Here, Major General Blake, a man of many quotable quotes, has often said: "The chances are, no one comes into this argument with completely clean hands." The important thing to us now is that the problem still exists and must be solved. Equally important is to study mistakes that caused us to be where we are today and act to see that they are not repeated.

Other Studies Noted

To continue with the TACAN unknowns. The unknowns concerning the number of TACAN channels required, which, of course, involves the number of TACAN channels available to meet this requirement, has been the subject of a study by the National Bureau of Standards, the Airborne Instruments Laboratory, and by an Ad Hoc advisory group to the ANDB. This latter group (ANDB Advisory Group No. 3), which represented all classes of users of the airspace, developed a plan which satisfies all classes of aircraft and allows for new types planned for in the foreseeable future. This plan calls for complete area coverage of the United States from 75,000 feet mean sea level down to 18,000 feet mean sea level; and solid coverage on a basic route structure from 18,000 feet mean sea level down to 700 feet above terrain. This look at navigation requirements was necessary in order to estimate the number of ground equipment sites, and which determine the number of channels required.

System Developed

Concurrent with these studies, the Airborne Instruments Laboratory, by an Air Navigation Development Board Project, assisted Federal Tele-Communication Laboratories, the developers of TACAN, in taking measurements of TACAN system performance. This step was required to derive data necessary to develop an electronic grid plan for the siting of ground beacons. Range, altitude coverage, and adjacent and co-channel protection ratios were determined in this project.

The results of the above two studies were sent to the National Bureau of Standards, who, using the calculated

(Continued on Page 14)

Building Union Responsibility

Management Spokesman Advises Employers How They Can, By Careful Planning And Programming, Assist In Developing Maturity Among Their Union Representatives

By Herbert O. Eby

General Labor Relations Director, Pittsburgh Plate Glass Co.

(*From* PERSONNEL JOURNAL)

One important requisite to a successful business is obtaining and maintaining top volume consistent with top quality. This is called productivity. Productivity is influenced by an employee's will to work. If he is disinterested, his productivity will tend to be mediocre. But if he carries personal enthusiasm to his job, the likelihood will be improved productivity.

If labor and management could inject into all manufacturing enterprises just a part of the "get-up-and-go" enthusiasm of an alley garage mechanic starting his own business, the resulting increase in productivity would raise the American standard of living immeasurably.

Impact Of Union-Company Ties

The relationship between the union and the company definitely has an impact upon an employee's attitude toward his job. If the union is a responsible organization and its relations with management are on a mutually cooperative basis, there is a good prospect that the attitude of employees will also be cooperative. However, if for whatever reason the union is irresponsible or the company is anti-union, or the relations between the two are strained or belligerent, it is likely that many employees will in one way or another reflect an adverse attitude at their daily work.

So much for a few background comments. Now to enumerate ten ways in which employers can, by careful planning and programming, assist in building responsibility and maturity among union representatives.

▸ **Full Recognition:** It is essential that an employer extend unreserved recognition to the collective bargaining agent representing his employees. This means more than just going through the motions. It means a genuine and wholesome desire to fully accept the union as the spokesman of the employees, on matters of wages, hours and working conditions.

Further, the company should recognize that collective bargaining is more than a one-shot annual event. It is a dynamic, day-in-and-day-out relationship that continues through the contract year.

Unfortunately, even today, nearly 20 years after the original Wagner Labor Relations Act, there are still some employers who openly oppose unions in their plants, even though they are selected by a majority of the employees. There are other employers who do not oppose but resent unions; and still others that go along half-heartedly. While such employers are entitled to their opinion on unionism, they are not likely to set a good example of having reached maturity in the labor-relations field. A union that has to claw every inch of the way for full recognition—even after winning bargaining rights— may quite understandably become impatient and irrational.

It is also true that there are some unions that mistakenly believe that to survive they must be "anti-management". More often than not such unions are also anti-American. If so, a program of practical cooperation as outlined in this article has little prospect of success.

Workers' Chance To Speak Up

▸ **Proper Handling of Grievances:** The attitude of a company towards the processing of grievances can have a definite bearing upon union responsibility. For example, if a foreman resents an employee filing a grievance because it seems to him to be picayune, or because he feels it was filed in anger, or to satisfy some personal gripe, it is unlikely that he will approach the discussion of the grievance with an open mind. Under such circumstances, the union steward may well have ground for criticism.

It is, of course, obvious that there are occasions when the amount of time spent in investigating and hearing grievances is out of all proportion to the actual substantive value of such grievances. However, in all walks of life it can be demonstrated, in retrospect, that a great deal of time is wasted on trivialities. In any event, it is far better that employees feel free to exercise the privilege of protest than to be stifled or suppressed. This is democracy in action.

One of the main functions of a union is to provide employees with the opportunity to "speak up" and to have their problems resolved by union representatives who will present the grievances to management in the best possible light. Therefore, management should avoid being critical of employees or union representatives who press for favorable settlements. Management should also avoid blindly supporting the decisions of supervisors where uncontrovertible facts favor the employee. If a company fails to subscribe to the right of employees to have their "day in court" and fails to endorse the spirit as well as the letter of contractual grievance procedure, they will also fail to encourage the growth of responsibility among union leaders.

Don't Make People "Take Sides"

▸ **Avoid Competing for Employees' Loyalty:** Competition with a union for the support of employees invariably leads to unstable labor relations. The irony of the situation is that the employee often wonders what the furor is all about. To him, the company means one thing and the union another. One affords a job whereby he can provide for his personal and family obligations. The other provides guidance for his social, educational, perhaps political and certainly economic welfare. The employee feels that he can be loyal to both quite handily; therefore, it is the company or the union that makes loyalty an issue.

The employee does not want to take sides, and management should not unwittingly be a party to any program which can have the effect of forcing him to "choose" between the company and the union. Management makes a mistake if it fails to recognize these destinctions, because otherwise it spends money and time pursuing a futile course. Instead, management

should endeavor to make the employee proud of both his union and his company.

▶ **Cooperate on Communications:** Management should work with, not around, the union in the field of employee information. This is one phase of industrial relations in which companies have made serious mistakes. Permanent impairment of good labor relations may result from trying to out-race or out-maneuver the union in getting a message across to employees.

For example, if a dispute goes to the appeal step of the grievance procedure, it seems inadvisable for the foreman to jump the gun on the steward and tell the employee what happened. This is a union grievance problem and it is quite appropriate that the union steward relay the message. In contrast, company information concerning new products, work schedules, level of operations, the outlook for business, etc., are properly disseminated by management. In brief, it is advisable to work out with the union an understanding on the area of communications that is logically theirs and the area that is logically management's.

Unions Will "Play Politics"

▶ **Recognize that a Union is a Political Organization:** There will be times when we are a little unhappy about it but, nevertheless, certain things are done simply because it is politically expedient. However, management should not be any more critical of "union politics" than they are of "government politics", "company politics", "church politics", "country-club politics", or "school-board politics". We acquiesce in that kind of politics, but when it is carried over to the union side, we tend to think it is iniquitous. To the extent that we are unduly critical of union politics, we foster union irresponsibility rather than responsibility.

▶ **Training:** In addition to the training provided by the union organization, some companies are developing educational programs for both stewards and foremen. There are a few that have progressed to the point of holding joint training sessions in cooperation with the union. When management is ready for this and sure of its ground, it is an excellent idea. But, in the early stages, it is better to go slow, perhaps giving a course in contract interpretation to the foremen and then providing an identical but separate course for the stewards. There are a number of healthy off-shoots from such a plan. One is, the union is made aware of the fact that there are no secrets. The stewards are told the same story as the foremen.

Another beneficial program at the foreman and steward level of training is just plain good human relations . . . how to get along with people. A Charter of Labor Relations guides supervisors and stewards in their daily relations in many Pittsburgh Plate Glass plants. These and related programs are background for specialized and perhaps technical courses tailored to meet a plant's particular needs. All such programs encourage leadership and develop mutual respect and understanding.

Tread Softly Where You Can

▶ **Separate the Areas of Conflict from the Areas of No Conflict:** It's unrealistic to expect in the field of industrial relations that the interests of management and labor can ever be fully compatible. Those who think so are deluding themselves. For example, in contract negotiations, grievance procedure, and arbitration, the goals of management and labor are frequently at cross-purposes. What may be a fair and reasonable wage demand by the union may not be fair or reasonable to a particular company. Similarly, in grievance and arbitration cases, both may be honestly contending for widely-divergent results stemming from agreed-upon facts.

While there are admittedly these areas of conflicting interest, if management will only take the time to analyze the entire human-relations problem, they will find that there is a larger field in which there is little or no conflict of interests.

For example, such matters as suggestion committees, safety programs, good housekeeping, social activities, community chest drives, absenteeism, annual picnics, and open-house affairs basically do not involve a conflict of interest. Further, in these non-conflict areas management can afford to place less emphasis on management prerogatives if that is the key to employee and union cooperation, provided, of course, that the final decision on these matters rests with management. The fear, expressed by some, that if you give the union an inch it will take a yard, has practically no support. All major unions have repeatedly stated that the responsibility to manage rests solely upon management.

To be specific, consider the benefits flowing from joint sports programs. If a foreman roots for Sam to knock the ball over the fence, he is likely to root for Sam on the job—although Sam is a union steward. Similarly, if a union grievanceman is pulling for Frank, a team-mate, to pull that spare break, sink that putt, or catch that pass, he is likely to continue to be a team-mate in the plant—although Frank is a foreman.

Work Out Programs With Union

Let's turn from morale to job satisfaction. If after a study it seems advisable to go into a job evaluation program—thereby removing job inequities and discrimination—the best results will be obtained if the program is worked out with the union so that the final plan has full union indorsement. Union support stamps out any doubt or hesitancy that might otherwise exist among some employees.

A similar approach should be considered if the problem is improved productivity—the key to profits. In many lines of manufacture, it is possible to raise the volume of production and thereby lower unit costs by a plan of incentive compensation. Such plans have a greater margin of success if the union is in the know from the beginning. Give the union an opportunity to show how costs can be cut and in return how employees should share in the savings. Union support of an incentive plan is the bridge to employee cooperation. Unilateral incentive plans frequently become a hot bed of trouble and can more than offset any good that might otherwise be derived.

Industry will find there is much to be gained by full cooperation with the union in these areas in which there is a mutuality of interests. When the union has an opportunity to make suggestions, to voice opinions, to participate in advice giving and to join in social and sports programs, management may accomplish several things. One, the union's interest in constructive programs is emphasized. Two, this cooperation in the non-conflict areas has a sobering influence on the conflict areas.

Better Climate For Negotiations

If, all during the year, foremen and stewards have had a part in joint programs and have learned to know each other better, the climate surrounding the annual negotiations will be better. Under such circumstances, company counter proposals to union economic demands are placed before a friendly group that have been on the inside instead of a strange group that have been on the outside. Facts and figures presented by the company will be more attentively considered by union representatives who are convinced of the company's sincerity than by those who

The ALPA Camera

UAL-TWA Crash

Pres. Sayen opens three-day meeting of ALPA Air Traffic Control Committee held at Home Office in conjunction with the UAL and TWA pilot crash investigators of the Grand Canyon accident. 26 recommendations to solve ATC problem were proposed.

Negotiators Conference

Recent ALPA Negotiators staff conference called to review and coordinate current industry problems and techniques and plan policies to meet current and future problems. L. to r. (sitting): H. M. Jones, Pres. C. N. Sayen, Exec. V.-P. K. McMurray; (standing): K. J. Ulrich, F. J. Albright, J. Meiser, J. Ulm, V. J. Herbert, G. R. Johns, J. C. Christie, P. F. Dwyer, R. L. Harkenrider, W. J. MacWilliams.

F-27 Committee

ALPA Fokker Friendship F-27 Evaluation Committee during organizational meeting at Home Office gets initial briefing from T. G. Linnert, ALPA Engineering & Air Safety Dept. (left).

are antagonistic and suspicious. Management cannot "fence the union out" all during the year and then expect enthusiastic union cooperation and responsibility at negotiation time.

▸ **Management Calm During Crises:** Another aspect of industrial relations that has considerable bearing upon the building of responsibility among union representatives is for company personnel to set an example of patience and restraint during difficult bargaining situations. Some management representatives have a tendency during a dispute with the union to become irrational, frustrated and boisterous. They blame their problems on the "union." They lightly overlook the fact that long before unions, mankind was feuding. The world has witnessed an unbroken succession of wars since time immemorial. We can't even keep peace in our homes. But somehow we take all these disappointments in stride.

Isn't it time that management also takes labor disappointments in stride? If management is excitable or irritable at the bargaining table, it can hardly be surprised if the union also flares up. On the other hand, if we recognize that we are going to have honest differences of opinion but nevertheless we resolve to look at each situation calmly and patiently, then it is more than probable that negotiating in such an atmosphere will induce the union representatives to do likewise.

Don't Keep Union Guessing

▸ **Be Firm When Necessary:** Management contributes to union irresponsibility when the union is never sure where management stands. Most unions have far more respect for a company that has analyzed all pertinent economic information that has a bearing upon the negotiation, and that will say when the time comes, "Based on a fair appraisal of the facts, this is the best we can do." Until management reaches the point where the union knows that a final offer to the union at the end of negotiations means just what it says, the union cannot be blamed for trying to put on one more bite and then another and another. To be vague or uncertain is to court disaster. In short, if management is vacillating and immature, it encourages treatment in kind.

▸ **Public Relations:** Most companies realize that they cannot operate without regard to the impact that a manufacturing establishment has on the community in which it is located. This impact ranges over a wide front. Just a few examples include traffic problems, housing, roads, utilities, air and stream pollution, charities, schools and taxes. If a company shirks its community responsibilities, it is not unlikely that the union will become more militant and demanding because of their suspicion that such a company will also shirk its responsibility to its employees. A company has a lot at stake in whether its reputation in the public eye is favorable or not.

Helps Attract Best People

One of the important results of the company's standing in the community is that those companies with the best reputation attract the best employees. Further, such employees are generally more levelheaded and interested in the success of the company because they know that their own prosperity and security is inevitably tied into the prosperity and success of the company. It follows that union officers and grievance committeemen selected among workers of this caliber are bound to be more responsible and mature.

Finally, let me emphasize that management can contribute, by words and deeds, to union responsibility. But, unless we work at it, we can very easily take or neglect to take, steps that can be a source of discontent leading to irresponsibility in union conduct. Labor and management are natural partners in a democratic industrial economy. It takes both—pulling together—to obtain maximum success.

This combination of management and manpower coupled with money, materials and machinery, has produced for all of us the highest standard of living in the world. Management must never falter or deviate from its responsibilities because its employees choose union representation. Instead, management should afford a union every opportunity to demonstrate that it can be both constructive and responsible. Here, there is a potential of the biggest bargain management can ever gain from collective bargaining. Here, there is a challenge that holds the promise of far-reaching rewards.

Know Your Officers

N. G. Carper

Norwood G. (Chris) Carper, who recently assumed his duties as Vice-President of Region IV, is a TWA Captain, living in Kansas City.

Approaching his twentieth year as an air line pilot, his ALPA activities began in 1937. Since then he has served from time to time on the LEC and as a member of various committees. In 1950, he was Chairman of TWA Council No. 3 and the Master Executive Council.

Born near Roanoke, Va., on July 27, 1914, Carper began his flying career in 1929, when he started building and flying gliders during the period when gliders and sailplanes were popular. From 1931 to 1935, he operated a flight school and charter service while still in high school and college.

After graduating from college, he moved to California and flew one of the first freight lines operated between Los Angeles and San Francisco. In early 1937, he joined Hanford Airlines (later Mid-Continent and now Braniff), and in 1939 joined Marquette Airlines, which later merged and became a part of TWA.

During World War II, the new Regional Vice-President served overseas for almost two years with the 8th and 12th Air Force and later transferred to the Air Transport Command. He returned to TWA in late 1945, after serving as Chief, Air Safety Division Headquarters, Air Transport Command, in Washington.

Married for 15 years, the Carpers have two sons and one daughter—Jim, 9; Cherie, 7, and John, 4.

The Flight Instrument Panel

In Order To Fulfill Their Purpose, Flight Instruments Should Be Arranged So That They Speak A Universal Language And Not Be 'A Tower Of Babel'—An Air Safety Forum Report

By Capt. J. J. Kelley
EAL

The Bible states that: "There shall be order in the heavens." It behooves us who venture up there to do nothing to contradict that mandate.

Since flight instruments to fulfill their purpose must speak their message, we should strive so to arrange them that they speak a universal language, rather than construct a "Tower of Babel."

It is timely, here, to establish three general classifications of flight instruments.

▶ One group provides information as to the broad navigational situation and is referred to as "situation display" instruments.

▶ One group provides pitch and roll information and is referred to as "attitude control" instruments.

▶ One group provides information on the lift, or flyability of the airfoils and is referred to as "sustentation control" instruments. In this category are the air speed and angle of attack indicators.

The prime requirement in flight instrument arrangements is that the transition from visual flight to instrument flight and vice versa should be an easy and natural one, and that the general pattern of control responses required of the pilot in instrument flight should be similar to those required under visual flight conditions.

To Achieve This Goal

▶ Attitude-sustentation-control flight instruments should be such as to require the shortest possible eyetravel from outside-the-airplane to inside-airplane references.

▶ Navigational-situation-display instruments should be positioned immediately adjacent, vertically, to attitude-sustentation-control flight instruments.

▶ Outside-the-airplane references should be simultaneously amplified with sustentation information.

▶ The information display of the individual instruments, and the positions of flight instruments and signal lights relative to each other should be such as to most nearly approximate outside visual references, and should require the minimum of eyetravel in "scanning" to assimilate essential information.

Whenever it is possible to display, in a natural, easily assimilated manner, the information of several instruments within the ample-sized face of a single instrument, the scanning effort and time can be safely reduced and better control achieved.

As an example, consider a youngster trying to follow the progress of a baseball game through several knotholes in a fence, each one of which commands a view of only one of the bases. He watches the batter take his "cut," then dashes to another knothole to see the action at first base, to yet another to see him slide into second base, to another for the play at third, and the poor kid just misses the spectacular "put out" at home plate.

Now, a friend happens along with a pair of "stilts" which our "knotholer" borrows. Strapping them on he finds that he can see right over the fence. Now he is in business, and able to take in all the action at a glance.

There is a distinct parallel in flight instruments, for if each one shows but a single facet of the total picture, it is an obvious gain in comprehension and comfort if we can reduce the number of knotholes we must use, or enlarge the one that is available.

Best Arrangement Needed

▶ The instrument arrangement should be such as to best facilitate "instrument approaches" and "instrument takeoffs," (which maneuvers allow the least margin for errors in angle of attack, attitude, direction, airspeed, altitude, and geographical position) and should still be excellent for normal climb, cruise, descent conditions and visual flight just prior to touchdown.

▶ Positions of flight instruments and engine power instruments, relative to each other, should be such as to require the least possible eye travel from one group to the other in making power changes, or in monitoring power settings, and this "scanning" should be in the same horizontal plane.

▶ It is a demonstrated and established fact that horizontal "scanning" is more natural and easy than vertical scanning, viz, as in reading, since movement of the eyelids is not involved.

It is likewise true that an indicator needle in a horizontal or vertical attitude, even though on the periphery of one's field of vision, conveys a message to the observer which does not require reading or interpolation.

There is a continuous awareness of significance of such indications so long as the needle maintains its horizontal or vertical attitude.

There is, likewise, a recognition of change from the norm that these two attitudes delineate whenever a needle moves from the horizontal or vertical, (which are the basic equilibrium references for human beings).

Furthermore, the direction of needle travel from the horizontal is naturally associated with the upward or downward movements of bodies, and with increases or decreases in values.

Similarly, movements of a needle from the vertical, when used to display direction, are most naturally associated with turning or pointing if the needle is so pivoted that the top end is the moving end, or direction indicator, as in pointing a finger.

Advantage must be taken of these natural interpretation tendencies if we are to lighten the pilot's ever-increasing load.

This is as basic in the display of engine and accessory systems information as it is in the flight instrument display.

▶ It necessarily follows that the instrument arrangement which is the most natural one to manually fly by will be the most effective one by which to monitor automatic approach-coupler operation, and to revert to when "taking over" manually for the landing.

Pilot's And Copilot's Panels

▶ The captain's and the pilot's instrument panels should have the same basic arrangement, to facilitate the transition from the copilot's seat to the "command" seat.

▶ To facilitate and "goof-proof" power settings in the approach configuration, all relevant needles should be horizontal at the 9 o'clock position, when the approximate power for the

maneuver is set up.

▶ To reduce the time and effort required for engine condition instruments scanning, and thereby increase the frequency and accuracy of such monitoring, all temperature, pressure, voltage and amperage "normal" indications should be portrayed by a horizontal needle attitude, with increasing values depicted by an upward movement of the needle and vice versa. This same arrangement is applicable in dual instruments using opposed needles.

▶ An extensive series of tests, involving moving-pictures of pilots' eye travel during an instrument approach under very low ceiling conditions, demonstrated the startling fact that the systematic instrument-scanning of the pilot, which was continuous during the approach, terminated abruptly once visual ground contact was made, and that thereafter there was a fixation of the eyes on outside-the-cockpit references, whether in day or night operations. Obviously this left the pilot with no information on sustentation and, as a consequence, many near accidents have developed. Now that it is possible to supply sustentation information to the pilot while he is engrossed with outside references, it is imperative to do so. Such information, so presented, will also greatly enhance the safety of operation during all takeoffs and landings, as well as during circling and climbing operations at low airspeeds, during which there is the frequent distraction of watching for other aircraft. This factor becomes increasingly aggravated in swept-wing aircraft, where the C/L curve crosses the C/D curve abruptly. Prior to the recognition of this hazard, numerous carrier-based aircraft were lost on approaches and on takeoffs.

Distraction Can Be Fatal

▶ Investigations of numerous, recent, jet aircraft landing-accidents have led to the conclusion that the briefest of intervals of distraction from flight instruments during an approach, which had been occasioned by the necessity of changing frequency on a radio transmitter-receiver, whose frequency selector was awkwardly located in the cockpit, had probably resulted in the fatal crashes of these clean, high performance aircraft, which lose altitude at a catastrophic rate of descent if briefly unattended.

The principle involved, of course, is that anything that must be handled or repositioned by the pilot during operation close to the ground, and which will occasion him momentarily to remove his eyes from the instruments, should be so located as to require the least possible hunting or reading. In the case of radio controls, they should be below eye level, close to handle and easily read.

▶ As a general principle, no equipment that the pilot will normally be required to operate in flight should necessitate vacating his seat to do so. This consideration becomes increasingly critical in very high-altitude, highly-pressurized aircraft, which are presently subject to the possibility of explosive decompression. In anticipation of this condition, both pilots should be continually in their seats. Loran, or other navigational equipment, is in this category when it is intended that the pilot shall operate it.

Space For The Helicopter

The Rotary-Wing Aircraft's Role In The Future Airspace And Control Picture

By Howard Higgins

Chief Pilot, New York Airways

It is generally known that the air space over some of our areas has become too congested with air traffic and that various agencies and people are taking steps to correct these conditions. Also with the advent of jet equipment in commercial operations, different concepts of traffic control have to be devised. I would like to point out when this happens we very definitely want to have helicopters considered and assigned in the overall picture.

Following is an outline of some facts, recommendations, and explanations that I would like to present to you for your consideration:

Facts

▶ The helicopter has now reached the state of the art where a considerable number of them are being used, so it is necessary to consider them in the overall air space control picture.

▶ The helicopter has a permanent place in the air transport picture; for example New York Airways is the second largest operator at LaGuardia Airport in terms of schedule with 142 movements per day.

▶ Existing airway routings and airport traffic control zone procedures were developed in consideration of fixed-wing capabilities—for the most part. Certain portions of the Civil Air Regulations allow recognition of the helicopter's slow speed and high maneuverability by authorizing lower visibility and ceiling requirements for enroute helicopters.

▶ To date, an outline of an interpretation of this portion of the Civil Air Regulations has not been made in the traffic controller's manual (ANC/PCAT) so the controller and helicopter pilot could take advantage of the helicopter's capabilities with regard to separation. This places the helicopter operator in the undesirable position of not being able to plan scheduling with the required reliability. For instance, an operator could have route specifications of 500 feet and ½ and the weather be 700 feet and ¾ and the controller interpret his manual to require the helicopter be separated by 1000 feet or 3 miles from any aircraft operating in the area before he could release a flight.

Recommendations

▶ Helicopters and fixed-wing should be assigned different altitudes and tracks to allow more efficient use of terminal air space.

▶ Control criteria should be changed to allow more positive "on time" compliance by helicopters and fixed-wing in the terminal areas.

▶ Recognition of the fact that at the present state of the art helicopters can be flown on a very accurate track and altitude visually, and fixed-wings in the terminal area fly very accurate tracks on the present navigation aids (ILS, Radar, VOR, etc.).

I will now explain the reasons behind the recommendations:

Explanations

▶ Helicopters will, by their short flight legs and multiple landing sites in the terminal area, desire to use minimum altitudes. Also, the single engine aspect of present helicopters dictates the choice of tracks. If it were attempted to place the helicopter in the same patterns as the fixed-wing, three discrepancies immediately appear.

1.) The rate of acceptance of the fixed-wing would be slowed down to the speed of the slowest machine, i.e. the helicopter — approximately 70 knots.

2.) The single engine helicopters

could not use these tracks as they were not laid out with authoritative landing sites all along these tracks.

3.) These tracks do not go where the helicopter wants to go, i.e. heliports.

Existing IFR aids are laid out so as to be maximum aid—to fixed-wing aircraft—for example the ILS is always aligned with the runway most used in instrument weather. This is necessary for the fixed-wing to make approaches and land in visibility of ½ mile, but is of no great value to the helicopter which could approach from any direction safely under visibility of ½ mile without benefit of any navigation aid.

▶ It is recognized that ANC/PCAT allows a controller to issue a clearance for visual landing or operation of an aircraft within the control zone when the visibility is one mile at an altitude clear of clouds. When this is done standard ANC/PCAT (one thousand feet vertically, three miles horizontally, visual geographic or appropriate time-distance) IFR separation is applied between the aircraft operated visually and any aircraft being operated on an IFR flight plan. It is believed that this too was based on fixed-wing operation primarily. This loosely stated guide line tends to confuse controllers by not clearly spelling out "geographic separation" and requiring under "visual separation" that the controller be able to see both aircraft being separated—even though one is a helicopter two miles away, just out of sight but capable of giving completely accurate position reports such as building identity, street intersections, etc., and can remain in the same position within a radius of 200-300 feet.

▶ Helicopter tracks and altitudes have been laid out and are being flown at the present, over open areas to provide safe landing areas in the event of engine failure and below fixed-wing patterns. This is to preclude as much conflict as possible. The tracks are laid out and flown visually with an accuracy in feet instead of miles, i.e. "one side of a roadway or railroad." These accuracies are obtained by the pilot's complete familiarity with the routes as a result of very frequent flights over them. It must be borne in mind that ½ mile visibility is as adequate to a helicopter pilot flying at 70 knots as 3 miles is to a Convair pilot and 5 miles to a DC-7 pilot.

Figures

Now I would like to put some figures on my recommendations. I would like to emphasize at this point that the values of separation I give you, I do not want to become a hard and fast regulation but hope will be used as a base to allow the operator to gather experience and evaluate navigation and instrument aids down to very close tolerance but while still VFR to prepare the way for full instrument flights.

I know there are some thoughts and remarks at this point that helicopters are flying in some places with low minimums and close separation. This can be done by various means such as operations letters, through the back door, looking the other way and various other methods. I do not feel that this is a sound and practical basis, but do feel that inasmuch as we have a large amount of controllers and pilots operating in one area that a closely defined and understood outline will make for a smoother and easier operation.

I feel that in the terminal area, a) separation between fixed-wing and helicopters of 500 feet vertical and/or ½ mile lateral are safe and compatible values, b) helicopter to helicopter separation use only geographical separation. This is being done at the present under some conditions.

We have an excellent opportunity to lay the ground work for helicopter airways, routes, and so forth during this general re-shuffle of air space and control problems. If this is accomplished, helicopter operators will have a much better possibility of expanding schedules and operations at the rate we all feel the helicopter is going to expand.

Air Mail Pays Off

U. S. Post Office Dept. Nets Huge Profit On Faith In Early Air Mail Service

From BOEING MAGAZINE

A modern version of the miracle of the loaves recently brought cheer to that long-time financial loser, the U. S. Post Office Department. It was good, solid cheer: a whopping profit of more than $32,000,000 from air mail carried in 1955.

Like some among the fishermen of Galilee nearly 2000 years previously, certain members of Congress in 1918-21 were skeptical of casting their bread upon the waters—in the latter case, the troubled waters of early air mail service.

Men Of Vision And Faith

Fortunately, men of vision and faith prevailed. As a result American air transport was born. Now the harvest of loaves is returning to a thankful Post Office.

The first U. S. air mail was flown from Sheepshead to Jamaica on Long Island, New York, from September 23 to October 2, 1911. Pilot Earle Ovington flew this first mail, as a feature during an air meet.

The stunt did not immediately stir postal authorities with visions of large revenues from a premium mail service. By 1918, however, the use of planes in the first World War had given aviation a shot in the arm. The first regularly scheduled U. S. air mail route was established on May 15, 1918. It was flown by Army pilots in Army airplanes —modified Curtiss Jennies.

First Mail Route

The first mail was flown in three hops between New York City, Philadelphia and Washington, D. C. A few unscheduled landings were made in cow pastures because of engine trouble or bad weather, but by and large the venture was successful. Flying time from New York to Washington, including the Philadelphia stop, was about 3½ hours. Distance was 218 miles.

A year later, on March 3, 1919, W. E. Boeing, founder of the Boeing Airplane Company, and Eddie Hubbard flew the first load of international air mail. The trip was made from Vancouver, Canada, to Seattle in an early Boeing seaplane. This experimental flight sparked Hubbard's interest in the possibilities and led him later to bid on —and receive—the first contract for international air mail. For several years he conducted regular air mail service between Seattle and Victoria, capital city of British Columbia.

Take Over From Army

A few postal and government officials—including President Woodrow Wilson—were sufficiently intrigued by air mail possibilities to order the Post Office to take over the New York-Philadelphia-Washington route from the Army, in 1918. Later that same year and early in 1919 the flying postmen attempted to carry mail between Chicago and New York, failing both times.

Undaunted, the airmen kept trying until the service was established, in the summer of 1919, although two pilots were killed in 1919 and five in 1920. Flying the mail in rebuilt World War I

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planes—mostly Army deHavilands—was a precarious job. Over a period of years 30 of the original 40 air mail pilots lost their lives in tragic airplane crashes.

One of the pilots who survived was James Murray, now a Boeing vice-president and the firm's East Coast representative. Murray flew the Salt Lake City-Cheyenne leg of a history-making coast-to-coast air mail flight on Washington's Birthday in 1921.

Pioneer's Experience

This flight was one of the most dramatic and crucial events in aviation history. Air mail faced a threat of being cut off at the pockets for lack of public interest. In an effort to gain attention—and customers—ten intrepid pilots, relaying one another, staged a night-and-day cross-country flight from San Francisco to New York City.

Their night beacons were bonfires lighted by farmers, and their maps were the same as those furnished automobile tourists by gasoline stations. The air mail went across the nation in 13 hours and 20 minutes, cutting the previous time in half.

This feat won national acclaim. Equally important, it brought a $1,250,000 appropriation from Congress for continuation of air mail service. It brought a system of airplane beacons across the land and, in 1923, inauguration of scheduled night flights with the mail.

Use of air mail received its greatest impetus when the government invited commercial bids on its mail routes. Bill Boeing won the Chicago-San Francisco route with a bid so low that competitors predicted his financial demise. Boeing Air Transport came into being and, with a fleet of Boeing 40-A mail planes, began operation on July 1, 1927.

Belief In Publicity

Boeing's low bid was based on a belief that publicity could bring an increase in air mail volume. Consequently, BAT went vigorously into the fight for more air mail poundage. In San Francisco it turned loose a team of business getters known as the Boeing Airdales.

The Airdales rang doorbells, made speeches, showed movies, wrote articles and in general did the most all-fired job of tub thumping for air mail that ever has been seen. They were out after anything and everything they could get people to put air mail stamps on, from post cards to flowers.

When the Airdales got the mail load up to 500 pounds on Boeing 40s flying out of San Francisco every morning, they threw a lunch-time celebration that took all afternoon and part of the night to finish.

Finally there came a day when they put 1000 pounds of mail on the apron at the Oakland airport. By that time BAT had "big" trimotor Boeing 80 biplanes to pack the load across the Sierra Nevadas.

People didn't need to be told much about air mail after that. They had learned what is was and what it could do for them. It grew like a Kansas sunflower, until today instead of the Post Office supporting air mail, *it* is supporting the Post Office.

1955 Figures

In 1955, according to a Post Office report, 1,467,482,000 pieces of domestic air mail (including air parcel post) were delivered. In pounds that amounted to 84,775,000.

As for the U. S. international air mail, it rang the bell at 158,330,000 pieces or 7,137,000 pounds.

The part that really makes postal officials happy is the lovely green money air mail earns for them.

In 1955 gross revenues from domestic air mail were $142,571,000 and international revenues were $39,247,000.

Net profit on domestic air mail was $20,268,000, and on international was $12,161,000.

The total air mail profit, $32,429,000, made a fine black-ink entry on Post Office books. This year may be even better. The scraps of bread long ago cast upon the waters are coming back as well-baked loaves.

The TACAN Story . . .

(Continued from Page 5)

performance of the TACAN system against the requirements for navigation system coverage, have estimated the number of navigation system channels required of TACAN. This number has been determined to be 100. The minimum geographical spacing between facilities assigned the same channel for the different type of facilities is:

200 Nautical Mile Facility..500 NM
100 Nautical Mile Facility..250 NM
30 Nautical Mile Facility..150 NM
30 Nautical Mile ILS.....150 NM

On the basis of this geographical spacing, the following number of channels will be required:

200 Nautical Mile Facility 23 channels
100 Nautical Mile Facility 38 channels
30 Nautical Mile Facility 25 channels
30 Nautical Mile ILS 14 channels

100 channels

Part of determining the adequacy of TACAN to provide the desired navigation system coverage is finding the number of channels that TACAN could make available to the common system. Although the system was designed for 126 channels, certain of these are required by the military for their own exclusive use; other channels had to be discarded because of interference to other services in the same frequency space. The Joint Communications-Electronics Committee of the Joint Chiefs of Staff was asked to determine the number of TACAN channels required for exclusive military use. The Airborne Instruments Laboratory, by contract, was asked to determine the number of channels lost because of interference to other services in the frequency space occupied by TACAN. Although the specific findings of the Airborne Instruments Laboratory and the Joint Communications-Electronics Committee have security significance and are not appropriate to our discussion, it can be said that 104 TACAN channels are available for common system navigation use. This satisfies the requirement determined by the National Bureau of Standards to be 100 TACAN channels, leaves four for contingency purposes, and still provides the military with the exclusive channels they require for their own operations.

Aids Defense Plans

The second unknown, the relationship between the common system and the air defense ground environment, has been resolved by the Joint Communications-Electronics Committee. Here again the details are classified but it can be categorically stated that the need for TACAN in the Continental Air Defense plans has been confirmed.

The third unknown, concerning the international implications, is not easily settled and is outside of the areas of authority and responsibility of the Air Navigation Development Board. The Air Coodinating Committee, which is charged with the U. S. air policy matters will act on this presently unresolved unknown. The problem is appreciated by the ANDB; however, the fact that the military of NATO countries have the same interests in TACAN as do the military in the U. S., with civil aviation in these countries favoring VOR/DME in some instances, certainly does not contribute to the solution of the problem.

Summary

In summary, it can now be said that the ANDB has carried out its program of a year ago and has found TACAN suitable as a common system component. Its suitability applies whether that system is for civil and tactical military, or civil and non-tactical military aviation. TACAN has enough channels to give the required navigation coverage for the entire continent, from 700 feet above terrain to 75,000 feet mean sea level. It is compatible with the ground environment being developed for Continental Air Defense. No problems are known that would prevent TACAN from taking its place as the rho-theta navigation aid in a truly common system. These facts have been reported to the Air Coordinating Committee which is now considering the requirements of various classes of aviation, applying the TACAN's capability to these requirements, and in consideration of finances, timeliness, international implications, and security, establishing United States policy concerning its use.

The ANDB has done what it could within its authority and responsibility to resolve an awkward dilemma. It has found no easily acceptable solutions, but hopes it may have contributed to finding a way to satisfy the basic common needs of aviation. It does pledge, it will act to prevent such dilemmas from developing in the future.

Airport Safety . . .

(Continued from Page 3)

a spacing of some 5 feet. To come within direct vision or focus of the pilot's eyes, the gauge between the rows would be a compromise of 60 to 75 feet and the units in each row spaced 100 feet apart down the runway.

Dutch Ilfaka Lights

There are several European runways where the Dutch Ilfaka flush grill lights are being used, but none of these are installed in such a narrow gauge pattern. However, an immediate evaluation could be made at these airports that would be beneficial in drawing some preliminary conclusions as regards the effectiveness of lights of this type.

The present information as regards the use of flush lights for flare and landing is very scattered. Much time and effort might be saved if a project were undertaken by an impartial agency such as NACA for a complete study, investigation and evaluation of the entire field of runway visual aids for final flare and landing in minimum visibilities, including the extent that flush lights will fit into the picture.

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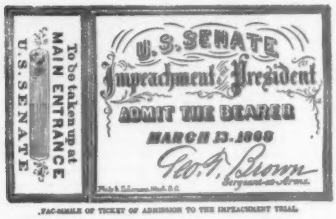
"I looked down into my open grave"



FAC-SIMILE OF TICKET OF ADMISSION TO THE IMPEACHMENT TRIAL

"MR. SENATOR ROSS, HOW SAY YOU?"

In the deathly silence of the Senate chamber, the freshman Senator from Kansas looked down, as he put it, into his own grave.

On deliberately trumped-up charges, the bitterly fanatic leaders of Ross's party were trying to vote President Johnson out of office—because Johnson stood between them and their revenge on the defeated South.

Ross, they knew, also disliked Johnson and wanted to punish the South. But, taking no chances, they had warned him to vote "guilty" or face political suicide.

And now, on that historic May morning in 1868, the verdict had come to hang completely on his vote. First falteringly, then loudly, he gave it: "*Not guilty!*"

That was sheer moral principle speaking. Edmund Ross refused to join a move he thought would wreck the historic powers of the Presidency. For this, he lost his future, lost his good name, and saved for himself only what he had saved for everyone: our democracy.

Into the whole fabric of American democracy is woven the steel-tough moral fiber of men like Edmund Ross. Braver even than battle courage, it has helped America become strong in many ways. So strong, that, today, one of the world's greatest guarantees of security is U. S. Savings Bonds.

For it is not American principal, but American principles, that back these Bonds. So, for yourself and your country, invest in United States Savings Bonds regularly. And hold on to them.

It's actually easy to save—when you buy Series E Savings Bonds through the Payroll Savings Plan. Once you've signed up at your pay office, your saving is done *for you*. The Bonds you receive pay good interest—3% a year, compounded half-yearly when held to maturity. And the longer you hold them, the better your return. Even after maturity, they go on earning 10 years more. So hold on to your Bonds! Join Payroll Savings today—or buy Bonds where you bank.

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